

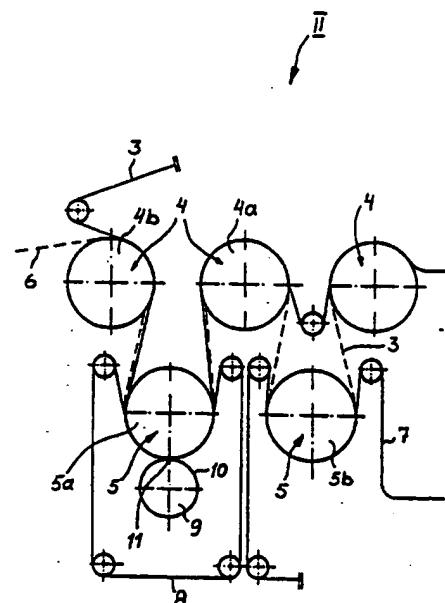


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/FI93/00206 <b>(22) International Filing Date:</b> 14 May 1993 (14.05.93) <b>(30) Priority data:</b> 922223 15 May 1992 (15.05.92) FI <b>(71) Applicant (for all designated States except US):</b> YHTYNEET PAPERITEHTAAT OY [FI/FI]; Tervasaari, P.O. Box 39, FIN-37601 Valkeakoski (FI). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only) :</b> SEPPÄNEN, Lauri [FI/FI]; Veikontie 2, FIN-37630 Valkeakoski (FI). <b>(74) Agent:</b> KAHILAINEN, Hannu; Tampereen Patenttitoimisto Oy, Kanslerinkatu 6, SF-33720 Tampere (FI).	<b>(81) Designated States:</b> AT, AU, BB, BG, BR, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Finnish).</i>	

**(54) Title:** METHOD FOR TREATMENT OF A PAPER WEB IN THE DRYING SECTION OF A PAPER MACHINE**(57) Abstract**

The invention relates to a method for processing a web of paper in a dryer section (1) of a papermaking machine, wherein the web of paper is subjected to drying by delivering it under the support of at least one dryer felt (3) around dryer cylinders (4, 5) located successively within the dryer section in the dryer felt running direction. The dryer felt is adapted to press the web of paper against a dryer cylinder adjacent thereto at any given location in its running direction. In order to achieve the conditioning of web of paper (6), at least one dryer cylinder (4, 5) is subjected to the following operations: A) this particular dryer cylinder (4, 5) is provided with a press zone (5a, 9, 11), B) web of paper (6) is carried through press zone (5a, 9, 11) between dryer felt (3) and an elastic element (8, 10), and C) press zone (5a, 9, 11) is produced by accompanying the dryer cylinder with a pressing roll (9) or the like.



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METHOD FOR TREATMENT OF A PAPER WEB IN THE DRYING SECTION OF A PAPER MACHINE.

5 The present invention relates to a method for processing a web of paper in the dryer section of a papermaking machine, wherein a web of paper is subjected to drying by delivering it under the support of at least one dryer felt around dryer cylinders arranged within the dryer section successively in the dryer felt running direction, said dryer felt being adapted to press the web of paper against a dryer cylinder adjacent thereto at any given location in its traveling direction.

15 This type of dryer sections are generally known in paper-making machines and may comprise a number of dryer cylinders, mounted successively in the dryer felt running direction and having axes of rotation that are substantially perpendicular to the dryer felt running direction. Generally, a dryer section is provided with at least two separate wires or dryer felts, the first being adapted to travel around an upper tier of dryer cylinders in the dryer section and the second being adapted to travel in a corresponding fashion around a lower tier of dryer cylinders in the dryer section, whereby a web of paper is adapted to be guided alternately from the upper tier of dryer cylinders to the lower tier of dryer cylinders always to a dryer cylinder that is next in the web traveling direction in a manner such that a web of paper progresses from the dryer felt of said upper tier of dryer cylinders onto that of said lower tier of dryer cylinders as a so-called open draw.

35 Especially in the manufacture of micro-creped paper, which the invention described in this application is preferably but not exclusively associated with, the dryer section is particularly provided with a so-called Clupak unit or compacting unit for producing light or micro-creping, said unit comprising a hard roll and a soft roll developing

therebetween a nip through which a paper web travels preferably at a dry matter content within the range of 50 - 70 %. The purpose of using a Clupak unit is to contribute to the quality characteristics of paper, especially flexibility, tearing resistance and elongation.

As for the prior art, a further reference can be made e.g. to Finnish Patent application FI-901978, which relates to a method for marking a flexible structure. According to the marking method disclosed in the cited publication, the impressions of a friction felt having a striped or uniform texture are copied on a sheet of paper by pressing an unpolished surface against the felt at the moment it is advanced to a yankee cylinder, especially in the dry section of a papermaking machine. The pressing is effected by means of a single or a plurality of presses which are called friction presses. Thus, the question is particularly about the treatment of single-side polished kraft paper for producing various patterns on the surface of paper.

Also in view of the prior art, reference can be made to Patent application FI-911987, which discloses a papermaking machine for producing a web of soft creped paper. Also this publication shows the use of a press roll for pressing the web of paper against a yankee cylinder in view of obtaining certain cohesion and softness values. According to the cited publication, a web of paper being advanced to a press roll is supported by means of a felt, the web of paper transferring onto such support from a former wire included in the wet end.

A particular object of this invention is to provide a method used in a dryer section as set forth in the preamble of the claim for effecting light creping. In order to achieve this object, a method of the invention is primarily characterized in that, in view of subjecting a web of paper to conditioning, especially to so-called micro-

creping, at least one dryer cylinder is subjected to the following operations:

- 5       - this particular dryer cylinder is provided with at least one pressing zone, through which
- a web of paper is advanced between a dryer felt and an elastic element, whereby
- the pressing zone is produced by accompanying the dryer cylinder with at least one pressing roll or a like.

10

Provided this way is a press zone, wherein a pattern included in the dryer felt can be transferred onto a web of paper traveling through the press zone, whereby an elastic element, which within the press zone lies on the opposite side of the dryer felt relative to the web of paper, assists in the formation of a dryer felt pattern or a surface configuration developing in the paper by equalizing single loads created by the dryer felt with projections included therein, whereby the web of paper, upon pressing against the elastic element, conforms to the dryer felt texture. At the same time, the solution is capable of avoiding the scorching of a web of paper onto a dryer cylinder since within the press zone, wherein the web of paper could possibly be subjected to a thermal load sufficient to cause scorching, said web of paper travels between a dryer felt and an elastic element and, thus, the web of paper is not in direct contact with the surface of a dryer cylinder as there is an elastic element between the cylinder and the web of paper.

30

According to one preferred embodiment, the dryer felt is adapted to travel in contact with the outer surface of a dryer cylinder. Thus, a dryer felt, which is functionally dimensioned to withstand the thermal loads existing at a dryer cylinder, is arranged in the most demanding location in terms of ability to withstand thermal loads applied to a web of paper.

35

According to another preferred embodiment, the dryer felt is formed from a normal dryer felt used in a dryer section. Thus, this solution offers the advantage that procedures effected within a press zone can be used to provide a web of paper with a surface configuration not unlike light creping, whereafter the dryer felt run continues as a normal dryer felt run over the section downstream of the press zone and preferably also upstream of the press zone. In other words, at least some of the dryer cylinders in the upper tier of dryer cylinders can be provided with a dryer felt which at a certain cylinder/cylinders, located both upstream and downstream of the press zone, serves as a normal dryer felt but which, within the press zone in applying the method, serves as an abutment felt or wire preferably against this particular dryer cylinder, thus providing an element facilitating the removal of a web of paper from the dryer cylinder in all conditions downstream of the press zone.

According to yet another embodiment, the pressing roll is adapted to be provided with an elastic coating, e.g. a rubber coating, serving at least as a part of elastic element. Thus, if the part of elastic element comprises an endless track, the elastic coating has a hardness index which is higher than that of the endless track. Hence, a press zone created this way includes two elastic zones, the first comprising an elastic element lying between a web of paper and a pressing roll and the second elastic zone comprising a coating applied to said pressing roll. This is to protect a web of paper from excessive deformations which could result in penetrating holes in a web of paper.

According a further preferred embodiment, the elastic element is made exclusively of an endless felt or a like, which is adapted to travel through said press zone, or the elastic element is made of an elastic coating applied to the pressing roll.

The other non-independent claims directed to a method disclose a few preferred embodiments for the invention.

5 A method of the invention will be described in more detail in the following specification with reference made to the accompanying drawings. In the drawings

10 fig. 1 shows a general schematic view of a dryer section of a papermaking machine, displaying schematically the position of a press zone intended for carrying out a method of the invention,

15 fig. 2 is a side view of a technical assembly required for producing a press zone, and

fig. 3 is a larger-scale view of a press zone.

20 In reference to fig. 1, the wet end M of a papermaking machine (a former section and a press section) is followed by a dryer section 1 with a built-in zone II, which includes a press zone of the invention. Furthermore, the dryer section may include a section upstream of press zone II,  
25 which is a so-called Clupak unit 2. Especially in view of dryer felt runs, the dryer section 1 may structurally be like any dryer section known from papermaking technology (a front, intermediate and/or rear dryer), e.g. a so-called separate dryer felt run arrangement, including on the one  
30 hand a first dryer felt configuration traveling around an upper tier of cylinders and, on the other hand, a second dryer felt configuration or a so-called single felt configuration traveling around a lower tier of cylinders. Thus, a method of the invention refers to a so-called on-  
35 machine process.

The general assembly of press zone II according to one embodiment is shown in fig. 2. Thus, a dryer felt 3, serving

as a dryer felt for an upper tier of dryer cylinders 4, is advanced to one dryer cylinder 5a included in a lower tier of dryer cylinders 5, whereby a web of paper, designated with reference numeral 6, is likewise carried along with  
5 dryer felt 3 to said dryer cylinder 5a such that it lies on the outer surface of the dryer felt as said dryer felt 3 comes into contact with dryer cylinder 5a. Adjacent to dryer cylinder 5a is located an endless elastic element 8, especially a felt assembly, which is separate from a dryer  
10 felt 7 of a lower tier of dryer cylinders and which in the vicinity of dryer cylinder 5a is applied against one surface of the web of paper. Adjacent to dryer cylinder 5a is further located a pressing roll 9, provided with an elastic coating 10, such as a rubber coating. Between dryer cylinder  
15 5a and pressing roll 9 develops a nip zone 11 for advancing web of paper 6 therethrough such that it lies between endless elastic element 8 placed against the coating of pressing roll 9, on the one hand, and dryer felt 6 placed against dryer cylinder 5a, on the other hand. Thus, a  
20 result of a thermal effect released from the dryer cylinder and, on the other hand, a compression effect developed in nip 11 is that the texture of a dryer felt transfers onto web of paper 6, whereby the web of paper conforms with the dryer felt texture upon pressing primarily against elastic  
25 element 8 and on the other hand against elastic coating 10 of pressing roll 9.

Downstream of press zone 5a, 9 and 11, said dryer felt 3 and web of paper 6 keep advancing to a next dryer cylinder  
30 4a in upper tier of dryer cylinders 4 such that said web of paper 6 presses against this particular dryer cylinder 4a identically to what happens with dryer cylinder 4b upstream of press zone 5a, 9, 11 in upper tier of dryer cylinders 4. In addition, fig. 2 illustrates a further  
35 stage of paper-web drying, whereby a dryer cylinder 5b downstream of the press zone in lower tier of dryer cylinders 5 operates as a normal dryer cylinder, said web of paper 6 being carried as an open draw to dryer cylinder 5b



for pressing it against the outer surface of the dryer cylinder by means of dryer felt 7. These operations as such are obvious for a skilled person and, hence, not explained in further detail in this context.

5

Fig. 3 illustrates in more detail the situation adjacent to press zone 5a, 9, 11. As shown in the figure, a combination of dryer felt 3, web of paper 6, and elastic element 8 arriving in press zone 5a, 10, 9 and 11 is essentially discrete but, as a result of pressing action applied by the press zone, said web of paper 6 conforms with a texture 13 of dryer felt 3 and said elastic element 8 disengages from web of paper 6 and dryer felt 3, as shown at 12 in fig. 3.

15

It is preferred that a press-zone operation be effected such that the web of paper has a dry matter content of 50-80 %, preferably 55-65 %. It is obvious that the elastic element can alternatively be either just an elastic coating or an endless track, as self-evident for a skilled person the basis of the above specification. Alternatively, instead of or in addition to dryer felt 3, the method can be carried out by using a so-called marking wire, the technical configuration of its run being within the normal abilities of a skilled person.

20

25

Claims

1. A method for processing a web of paper in a dryer section (1) of a papermaking machine, wherein a web of paper is subjected to drying by delivering under the support of at least one dryer felt (3) around dryer cylinders (4, 5) arranged within the dryer section successively in the dryer felt running direction, said dryer felt being adapted to press the web of paper against a dryer cylinder adjacent thereto at any given location in its running direction, characterized in that, in view of subjecting a web of paper (6) to conditioning, at least one dryer cylinder (4, 5) is subjected to the following operations:
- this particular dryer cylinder (4, 5) is provided with a press zone (5a, 9, 11),
  - web of paper (6) is advanced through press zone (5a, 9, 11) between dryer felt (3) and an elastic element (8), whereby
  - said dryer cylinder is provided with press zone (5a, 9, 11) by accompanying it with at least one pressing roll (9) or a like.
2. A method as set forth in claim 1, characterized in that said dryer felt (3) is adapted to travel in contact with the outer surface of dryer cylinder (5a).
3. A method as set forth in claim 1 or 2, characterized in that said dryer felt (3) comprises a dryer felt used in dryer section (1) and serving upstream and/or downstream of press zone (5a, 9, 11) as a dryer felt at least in a part of the dryer section.
4. A method as set forth in any of claims 1-3, comprising an upper and a lower tier of dryer cylinders, each including a separate dryer felt configuration (3, 7), characterized in that a felt (3) included in a different tier of dryer

cylinders and serving as a dryer felt therein is advanced through said press zone.

5 5. A method as set forth in any of claims 1-4, characterized in that said elastic element (8) is formed as an endless track.

10 6. A method as set forth in any of claims 1-5, characterized in that said elastic element (10) is formed as an elastic coating applied to pressing roll (9).

15 7. A method as set forth in any of claims 1-6, characterized in that the hardness index of elastic coating (10) is made higher than that of elastic element (8).

8. A method as set forth in any of claims 1-7, characterized in that the method is used for manufacturing sack paper.

20 9. A method as set forth in any of claims 1-8, characterized in that said press zone (5a, 9, 11) is located downstream of a so-called Clupak unit (2) included in the dryer section.

25 10. A method as set forth in any of claims 1-9, characterized in that the processing is effected with said web of paper (6) having a dry matter content of 50-80 %, preferably 55-65 %.

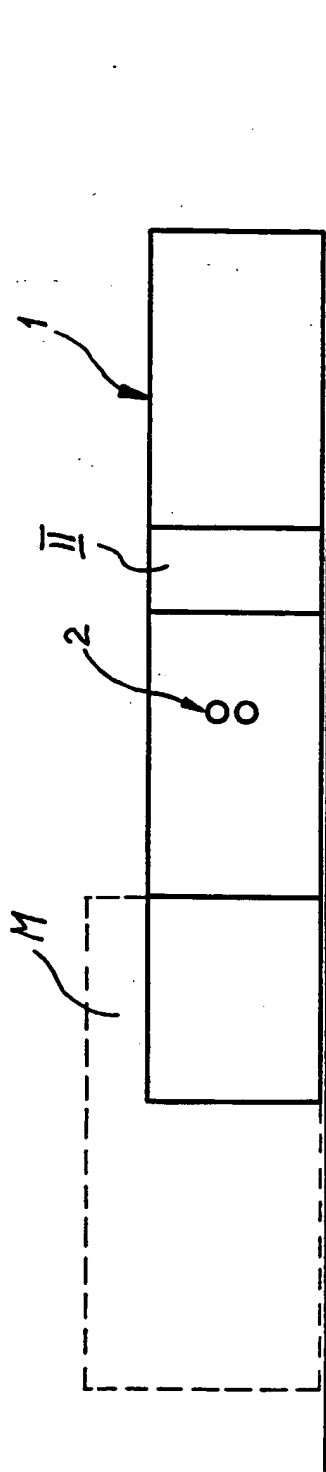
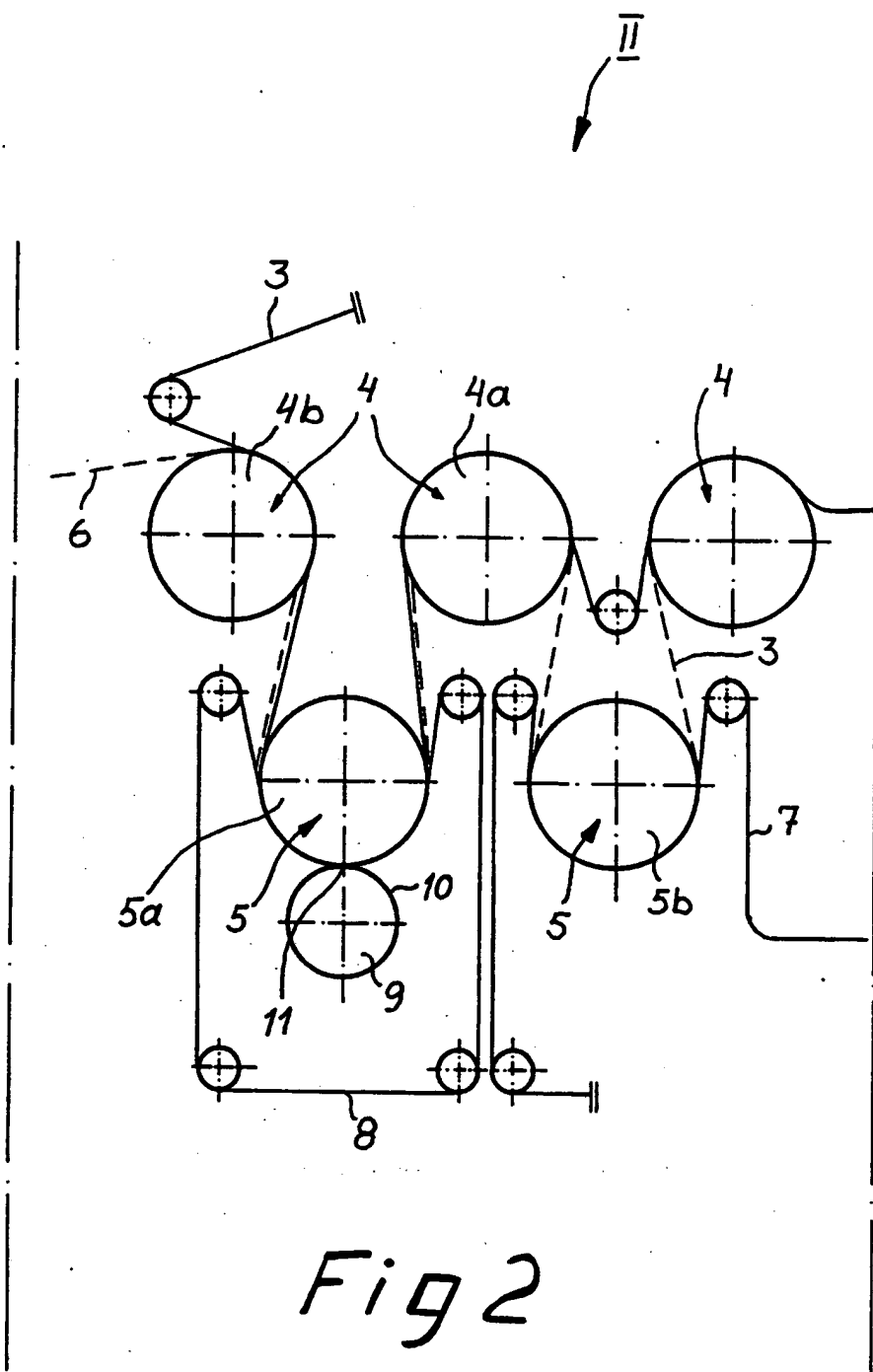
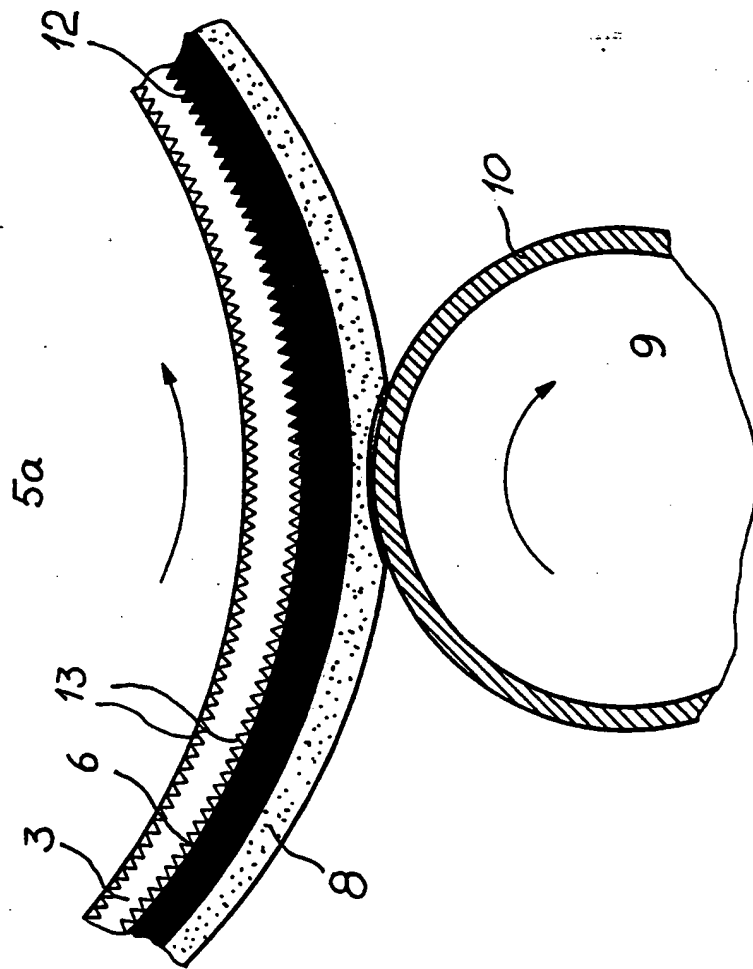


Fig 1





## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 93/00206

## A. CLASSIFICATION OF SUBJECT MATTER

IPC5: D21F 5/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP, A1, 0355873 (GARCIA PASTOR, DANIEL & GARCIA PASTOR, FRANCISCO), 28 February 1990 (28.02.90) --	1-10
A	GB, A, 2052586 (ST. ANNE'S BOARD MILL COMPANY LIMITED), 28 January 1981 (28.01.81) --	1-10
A	US, A, 3319352 (J.M. HAIGH), 16 May 1967 (16.05.67) -- -----	1-10

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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19 August 1993

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

02/07/93

International application No.  
PCT/FI 93/00206

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A1- 0355873	28/02/90	CA-A- 1314394 US-A- 4949471	16/03/93 21/08/90
GB-A- 2052586	28/01/81	CA-A- 1148735 DE-A- 3017446 JP-A- 56026092 SE-A- 8003675	28/06/83 27/11/80 13/03/81 20/11/80
US-A- 3319352	16/05/67	NONE	